The mammals of Kinchega National Park western New South Wales

Murray Ellis [1] and Klaus Henle [2, 3]

INTRODUCTION

Very little is known about the actual distribution of small mammals throughout the arid zone of Australia, with only a few published surveys being available (e.g. Brooker 1977; Fyfe 1985; McKenzie and Robinson 1987). Morton (1982) summarized our knowledge of dasyurids in Australia's arid zone and suggested that hummock grasslands are rich in insectivorous mammals whilst mulga shrublands are comparatively depauperate, a notion sustained by a study in central Australia (Fyfe 1985). Before any broader generalization about habitats and species richness can be drawn many more surveys in various arid zone habitats are necessary.

Kinchega National Park (32°28′S, 142°20′E) is located on the fringe of the arid zone in western New South Wales, immediately to the south-west of the town of Menindee (Fig. 1). It fronts the Darling River and encompasses Lake Menindee and Lake Cawndilla, both of which now permanently hold water. The park is a mosaic of floodplains (grey cracking clays) and sandplain/dune fields. Minor components are intermittent lakes and lunettes. The vegetation ranges from a narrow strip of river red gum *(Eucalyptus camaldulensis)* forest along the river, through woodlands and shrublands to chenopod steppe (see Robertson *et al.* (1987) for a more extensive description of the vegetation). The average annual rainfall for the park is 236 mm.

Dedicated in 1967 as a national park, the area had been part of a sheep property with a history stretching back to the 1850's. The mammalian history can be traced back further since the lunettes on the foreshores of the two lakes in the park, and on Lake Tandou just to the south-west, have proven to be both archaelogical and palaentological sites. These are aged at approximately 18-25 000 ybp and contain at least 39 mammal species including *Dasycercus, Thylacinus* and *Thylacaleo* (Tedford 1967, Merrilees 1973).

J. Eveleigh, one of the first rangers appointed to the park, searched through many of the old records of the area to compile a list of 28 native mammalian species being present in the general vicinity of the park early in the 19th century (Eveleigh 1978). These did not necessarily occur within the boundaries of the current park. Since the last century native mammals have generally suffered a decline in western New South Wales, whilst eleven species of introduced mammals have reached the Darling floodplain (Strahan 1983).

METHODS

The list of mammals by Eveleigh (1978) formed the basis of surveying the park. Attempts were made to confirm the presence of the listed species as well as searching for additional species.

The park was the site of extensive research from 1981 to 1988. Until late 1986, kangaroo research (Caughley, Shepherd and Short 1987) required spotlighting searches of the park four to eight times each year, plus searches on neighbouring properties on alternate trips. This allowed the collection of information on the larger mammals across much of the park plus occasional captures of dasyurids.

From September 1985 to May 1987, mammals were found during a herpetological study carried out involving sampling every second month (Henle 1988). Spotlighting was carried out for a minimum of one hour in both black box *(E. largiflorens)* woodland on heavy textured grey cracking clay and in hopbush *(Dodonaea attenuata)* shrubland on a dune. Pit trapping using 11 litre ice-cream containers was carried out in the same areas. Sixty-eight and twenty-five containers were used for a total of 14 080 and 8 250 trap days for the two areas respectively. During at least four nights per sampling period spotlight surveys were carried out in river red gum forest, open floodplains of low chenopod shrubs and forbs, bluebush *(Maireana pyramidata)* steppe on sandy soils and the shoreline of the lakes. On the lunettes around the lakes canegrass *(Zygochloa paradoxa)* was intermingled with bluebush and twelve pit traps were operated for a total of 1 080 trap days.

---

[1] New South Wales Parks and Wildlife Service, P.O. Box 1967, Hurstville, New South Wales, Australia 2220.

[2] Department of Zoology, Australian National University, G.P.O. Box 4, Canberra, A.C.T. 2609.

[3] Present address: Im Kalk 3, 7255 Rutenshiem, F.R. Germany.

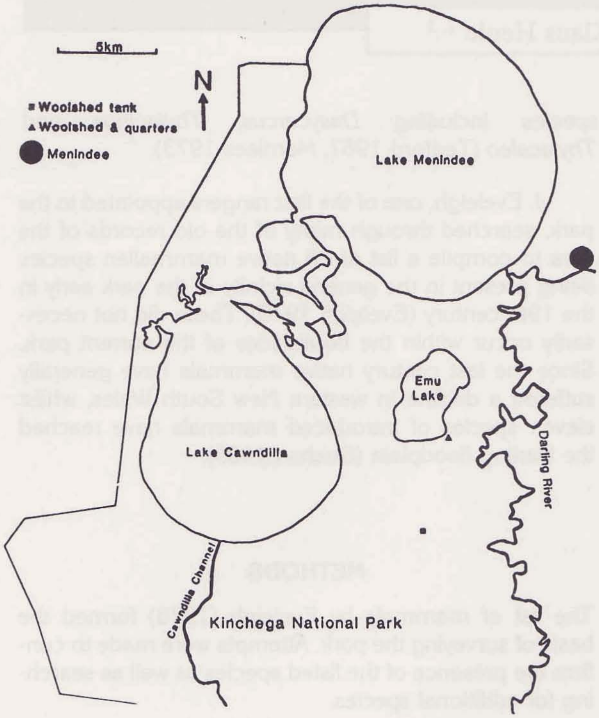

Fig. 1. A map of Kinchega National Park.

Spotlighting using a vehicle mounted 100W spotlight was carried out along the river at random intervals. This was aimed at locating any remaining populations of brushtail possums *(Trichosurus vulpecula)* plus water rats *(Hydromys chrysogaster).*

Bat trapping using mist nets and harp traps was carried out between 1984 and 1988. Mist nets were set at the old woolshed and around ground tanks. Harp traps were used in the woolshed, on flyways to a ground tank and in woodland on roadways. A single molossid was collected when it was knocked out of the air with a kangaroo carcass being thrown onto a traytop vehicle.

During September and October 1987 a period of intensive trapping was carried out. Pit traps were set in open woodland with an understorey of lignum *(Muehlenbeckia cunninghamii)* (105 trap days), in hopbush shrubland (70 trap days) and in bluebush steppe (84 trap days). Elliot traps were set in canegrass (50 trap days), prickly wattle (*Acacia victoriae*) shrubland (500 trap days), and open woodland with a lignum understorey (500 trap days). Cage traps were set along Cawndilla Channel and the Darling River (35 trap days).

RESULTS

Twenty species of native animals were located within the boundaries of Kinchega. Eight of these were additional to the 1978 listing, all of these being bats (Table 1). Eleven species of introduced mammals were also located within the park. However, four of these (dogs, horses, cattle and sheep) were strays from park visitors of surrounding properties rather than feral populations.

Nine species of native mammals showed evidence of breeding in the park (pregnant females, lactating females or juveniles). All seven feral species showed evidence of breeding within the park.

The status of each species was assessed as being in one of four categories: readily observable (can be found on most days that it is searched for), locatable (five or more individuals sighted), uncommon (less than five individuals observed) and not present (not seen during the study). This information about each species is summarized in Table 1.

Echidnas *(Tachyglossus aculeatus)* were observed in river red gum forest, open woodland, hopbush shrubland, bluebush steppe and on the foreshores of Lake Cawndilla. From 1984 to 1988 an echidna regularly resided under the Kinchega woolshed.

The fat-tailed dunnart *Sminthopsis crassicaudata)* was found in most habitats except the riverine forest and the lake foreshores. From July 1986 onwards this species was observed several times during each reptile sampling period and juveniles were trapped in mid-spring 1987. Faeces of trapped individuals contained the remains of spiders (Araneae) and ants (Formicidae).

One kultarr *(Antechinomys laniger)* was observed hunting around and inside a hollow tree in open woodland in January 1987.

The narrow-nosed planigale *(Planigale tenuirostris)* was regularly trapped in riverine woodland, most frequently in January 1987, when at least six different individuals were caught along an 80 m line of 17 traps. The number of planigales caught per month in the riverine woodland study area was correlated with the amount of rainfall during the capture month (Spearman's rank correlation $r_s=0.975$, $0.1>p>0.05$, $n=5$). In most months the species was also observed on the hop-

Table 1. The status, breeding evidence and habitat use of the mammals in Eveleigh (1978), plus additional species marked #, for Kinchega N.P. The status is: R=readily observable; L=locatable; U=uncommon; and N=not present. The breeding evidence is: P=pregnant; L=lactating; and J=juveniles. The habitat use is coded as: F=redgum forest; W=eucalypt woodland; S=shrubland; C=cracking clay soils; B=bluebush steppe; and Z=canegrass. Introduced species are marked with an asterisk.

			Breeding			Habitat					
Species		Status	P	L	J	F	W	S	C	B	Z
Tachyglossidae											
Echidna	*Tachyglossus aculeatus*	L	.	.	.	F	W	S	.	B	Z
Dasyuridae											
Western quoll	*Dasyurus geoffroyii*	N	.	.	.	.	.	.	.	.	.
Fat-tailed dunnart	*Sminthopsis crassicaudata*	L	.	.	J	.	W	S	.	B	.
Kultarr	*Antechinomys laniger*	U	.	.	.	.	W	.	.	.	.
Narrow-nosed planigale	*Planigale tenuirostris*	L	.	.	J	.	W	S	C	.	.
Paucident planigale	*Planigale gilesi*	L	.	.	J	.	W	S	C	.	.
Myrmecobiidae											
Numbat	*Myrmecobius fasciatus rufus*	N	.	.	.	.	.	.	.	.	.
Peramelidae											
Western barred bandicoot	*Perameles bougainville fasciata*	N	.	.	.	.	.	.	.	.	.
Pig-footed bandicoot	*Chaeropus ecaudatus*	N	.	.	.	.	.	.	.	.	.
Bilby	*Macrotis lagotis*	N	.	.	.	.	.	.	.	.	.
Vombatidae											
Hairy-nosed wombat	*Lasiorhinus* sp.	N	.	.	.	.	.	.	.	.	.
Phalangeridae											
Brushtail possum	*Trichosurus vulpecula*	U	.	.	J	F	.	.	.	.	.
Potorodae											
Brushtailed bettong	*Bettongia penicillata*	N	.	.	.	.	.	.	.	.	.
Burrowing bettong	*Bettongia lesueuri*	N	.	.	.	.	.	.	.	.	.
Macropodidae											
Eastern hare-wallaby	*Lagorchestes leporides*	N	.	.	.	.	.	.	.	.	.
Bridled nailtail wallaby	*Onychogalea freaenata*	N	.	.	.	.	.	.	.	.	.
Eastern grey kangaroo	*Macropus giganteus*	L	.	.	.	F	W	S	.	B	.
Western grey kangaroo	*Macropus fuliginosus*	R	P	L	J	F	W	S	.	B	.
Euro	*Macropus robustus*	R	.	.	J	F	W	S	.	B	.
Red kangaroo	*Macropus rufus*	R	P	L	J	F	W	S	.	B	.
Emballonuridae											
# Yellow-bellied sheathtail bat	*Taphazous flaviventris*	U	.	.	.	.	.	.	.	.	.
Molossidae											
# White-striped mastiff bat	*Tadarida australis*	U	.	.	.	.	.	.	.	.	.
# Little mastiff bat	*Mormopterus planiceps*	U	.	.	.	.	.	.	.	.	.
Vespertilionidae											
Lesser long-eared bat	*Nyctophilus geoffroyi*	L	P	L	.	.	.	.	.	.	.
# Gould's wattled bat	*Chalinolobus gouldii*	L	.	.	.	.	.	.	.	.	.
# Little pied bat	*Chalinolobus picatus*	L	.	.	.	.	.	.	.	.	.
# Western broadnosed bat	*Nycticeius balstoni*	U	.	.	.	.	.	.	.	.	.
# Little broadnosed bat	*Nycticeius greyii*	U	.	.	.	.	.	.	.	.	.
# Eptesicus	*Eptesicus baverstocki*	L	P	.	.	.	.	.	.	.	.
Muridae											
Water rat	*Hydromys chrysogaster*	U	.	.	.	.	.	.	.	.	.
Greater stick-nest rat	*Leporillus conditor*	N	.	.	.	.	.	.	.	.	.
Lesser stick-nest rat	*Leporillus apicalis*	N	.	.	.	.	.	.	.	.	.
Mitchell's hopping mouse	*Notomys mitchelli*	N	.	.	.	.	.	.	.	.	.
Long-tailed hopping mouse	*Notomys longicaudata*	N	.	.	.	.	.	.	.	.	.
Sandy inland mouse	*Pseudomys hermannsburgensis*	N	.	.	.	.	.	.	.	.	.
White-footed rabbit rat	*Conilurus albipes*	N	.	.	.	.	.	.	.	.	.
Long-haired rat	*Rattus villosissimus*	N	.	.	.	.	.	.	.	.	.
∗ House mouse	*Mus musculus*	L	.	.	J	.	W	S	C	B	Z
Leporidae											
∗ Rabbit	*Oryctolagus cuniculus*	R	.	.	J	F	W	S	.	B	Z
∗ Hare	*Lepus capensis*	N	.	.	.	.	.	.	.	.	.
Canidae											
∗ Dog	*Canis familaris familaris*	U	.	.	.	F	W	S	.	.	.
Dingo	*Canis familaris dingo*	N	.	.	.	.	.	.	.	.	.
∗ Fox	*Vulpes vulpes*	R	.	.	J	F	W	S	.	B	.
Felidae											
∗ Cat	*Felis catus*	L	.	.	J	F	W	S	.	B	.
Equidae											
∗ Horse	*Equus caballus*	U	.	.	.	F	W	S	.	.	.
∗ Donkey	*Equus asinus*	U	.	.	J	.	W	S	.	B	.
Suidae											
∗ Pig	*Sus scrofa*	L	.	.	J	F	W	S	.	B	.
Bovidae											
∗ Cattle	*Bos taurus*	U	.	.	.	.	W	S	.	B	.
∗ Sheep	*Ovis aries*	U	.	.	.	F	W	S	.	B	.
∗ Goat	*Capra hircus*	L	.	.	J	F	W	S	.	B	.

bush dune but only rarely caught in traps. Faecal droppings of trapped individuals were analysed. The small fragments were difficult to identify but remains of spiders (probably Lycosidae), beetles (Coleoptera), ants (Formicidae) and caterpillars (Lepidoptera) could definitely be indentified.

The paucident planigale *(Planigale gilesi)* was less common in riverine woodland than the *P. tenuirostris* and only irregularly caught in traps. However, it was seen at least once per reptile sampling period in riverine woodland and in most months on the hopbush dune. It further was occasionally observed in blue bush steppe and at the border of the redgum forest. It was the only dasyurid species found active during daylight – regularly from June to September. This species may use the same shelter for extended periods as two large hollows near the base of two bluebushes were daily used by two individuals. Faecal droppings of trapped individuals contained small fragments of spiders (probably Lycosidae), crickets (Gryllidae), beetles (Coleoptera) and ants (Formicidae). One specimen ate a juvenile gecko *(Heteronotia binoei)* while trapped.

Brushtail possums *Trichosurus vulpecula)* were only observed in or adjacent to the riverine forest. A juvenile was observed in spring 1987.

Eastern grey kangaroos *(Macropus giganteus)* were mostly observed in the woodlands and forest adjacent to the Darling River. Occasionally this species was observed in bluebush steppe. Western grey kangaroos *(M. fuliginosus)* and red kangaroos *(M. rufus)* were found throughout the park. Euros *(M. robustus)* were widespread within the park but were most common along the Darling River, the margins of the lakes and near Cawndilla Channel.

The emballonurid and mollosid bats were ocassionally observed when spotlighting near the floodplain areas of the park. Only *Mormopterus planiceps* was captured (Table 2).

Vespertillionid bats were seen across the park but identification was usually impossible in the spotlight except for *Chalinolobus picatus.* During winter this species' audible call allowed it to be located with a spotlight and its size and colour pattern were easily detected. Capture was required to identify the other species and also led to the location of maternity sites for *Nyctophilus geoffroyi* and *Eptesicus baverstocki* in the ceiling and hollow posts of the Kinchega woolshed (Table 2). *C. picatus* also used the woolshed as a roost site, whilst *C. gouldii* was found to use both the woolshed and hollow trees as roosts.

The water rat *(Hydromys chrysogaster)* was observed in August 1985 in Cawndilla Channel. It was also reported to enter pump sheds on riverfront irrigated orchards near Menindee (J. Rayner pers. comm.).

Table 2. Bats of Kinchega National Park. Captures were made at: W = Kinchega Woolshed, T = Woolshed Tank, H = Horsepaddock Road. Subscripting: L = Lactating, P = Pregnant.

	Mar 84	Nov 84	May 86	Nov 86	Jan 87	Feb 87	Apr 87	Jun 87	Aug 87	Oct 87	Jan 88
Mormopterus planiceps	—	H	—	—	—	—	—	—	—	—	T
Nyctophilus geoffroyi	W	—	—	W_L	W	W	W	—	W	W_PT	—
Chalinolobus gouldii	W	—	—	—	—	—	—	—	—	WT	—
Chalinolobus picatus	—	—	W	—	W	—	—	W	W	W	W
Nycticeius balstoni	W	—	—	—	—	—	—	—	—	—	—
Nycticeius greyii	—	—	—	—	—	—	—	—	—	T	—
Eptesicus baverstocki	W	—	W	W_P	W	W	—	—	W	W_P	W

House mice *(Mus musculus)* were abundant around the living quarters but were rarely found in the surrounding black box woodland and hopbush shrubland. They were also caught in canegrass and bluebush areas. Two colour forms were observed; one with a uniform brown fur and the other with pale ventral fur. These two varieties were also found by Denny (1975) in Sturt National Park.

Rabbits, foxes and cats were widespread through the park, although rabbits did favour the sandplain and dune areas as opposed to the floodplains. Donkeys were restricted to the sandplains of the south-west of the park. Pigs and goats seemed to be highly mobile, with goats being able to enter and leave the park over the boundary fence. Pigs had access to the park via the river and the lake foreshores. Control programmes are carried out in the park in an attempt to reduce the populations of these feral animals.

Observation records were lodged with the New South Wales National Parks and Wildlife Service fauna inventory scheme, "Wildata". Voucher specimens were lodged with the Australian Museum.

DISCUSSION

For the small terrestrial mammals, the black box woodland and the shrublands were the richest habitats in regards to species numbers (Table 1). There were about as many species as in the hummock grasslands surveyed by Fyfe (1985) in central Australia which supported five species. Pianka (1986) reported only one to three small terrestrial mammal species in his Western Australian desert study areas and concluded that the Australian deserts are impoverished in mammals as their role is taken up in part by reptiles. However, several Australian habitats (Fyfe 1985, this study) supported as many species as some North American desert habitats studied by Pianka (1986). Nevertheless, the fewer reptiles in the surveyed habitats in Kinchega (Henle 1988) compared to Pianka's (1986) sites support his competitive exclusion hypothesis. However, the widespread decline of many Australian desert mammals may have also contributed to Pianka's (1986) low species numbers.

The high number of species found in hopbush shrubland is surprising as ground cover was always limited, and only a few natural hollows at the base of bushes were available. Rabbit warrens were regularly used by planigales, but this was in an area adjacent to cracking grey clay more typically regarded as planigale habitat (Denny 1982). A second hopbush site further from cracking clays failed to produce planigales, but was also less intensively surveyed.

Apart from a chance capture of *Mormopterus planiceps,* bats were only captured at isolated watering points or around the Kinchega woolshed, a roosting site. Repeated trapping was necessary to discover the wide range of bats present, but even so *Tadarida australis* and *Taphozous flaviventris* were only spotlighted. Bats were the only species found during this study that were not recorded in Eveleigh (1978). Similarly, Tidemann (1988) found that historical records contained references to few of the bats that are extant at Mungo National Park. Hence little ecological information can be collected about arid zone bats without intensive research, and historical records are unlikely to reveal much about the smaller bats.

The dasyurids in the park appeared to be numerous, except for *Antechinomys laniger* where only one individual was seen. The native rodents, on the other hand, were regarded as being not present except for the water rat. *Pseudomys hermannsbergensis* has been recorded from Emu Lake in 1978 (L. Gibson pers. comm.) but no other native rodents have been found. Whether this lack of rodents is due to the introduced carnivores, competition with *Mus musculus* or the effects of a century of sheep grazing is not known.

Ten medium-sized terrestrial native marsupials and seven of the native rodents listed in Eveleigh's (1978) historical list were not found in the park. These are the mammals that have suffered general declines across the country.

Within the park there is no evidence of extinction of any native mammal, with the possible exception of *P. hermannsbergensis,* since its dedication as a national park. Even with the regional extinctions since European settlement of the area, the habitats within Kinchega National Park contain high numbers of extant mammal species compared with both other parts of Australia (Morton 1982; Fyfe 1985) and overseas (Pianka 1986). As a result of the survey we have a better idea of what is extant within Kinchega for the purposes of managing the park, particularly with regards to the bat fauna which was poorly known previously.

ACKNOWLEDGEMENTS

We would like to thank the numerous volunteers and National Parks and Wildlife Service staff who helped during the course of the various research projects at Kinchega, and the Royal Zoological Society of New South Wales members (M. Cochrane, S. Hamilton, C. Henley, J. Weber and P. Wilson and family) who scoured the park in the spring of 1987. We would also like to thank L. Gibson of the Australian Museum for verifying the identification of specimens lodged with the museum.

REFERENCES

BROOKER, M. G., 1977. Some notes on the mammalian fauna of the western Nullabor Plain, Western Australia. *West. Austr. Nat.* **14:** 2-15.

CAUGHLEY, G., SHEPHERD, N. AND SHORT, J., 1987. *Kangaroos, their ecology and management in the sheep rangelands of Australia.* Cambridge University Press, Cambridge.

DENNY, M. J. S., 1975. Mammals of Sturt National Park, Tibooburra, New South Wales. *Aust. Zool.* **18:** 179-95.

DENNY, M. J. S., 1982. Review of Planigale (Dasyuridae, Marsupialia) Ecology. *In 'Carnivorous Marsupials'* ed. by M. Archer. Roy. Zool. Soc. New South Wales, Sydney.

EVERLEIGH, J., 1978. *Mammal Fauna of the Kinchega Area.* New South Wales N.P.W.S., Broken Hill.

FYFE, G., 1985. A comparison of the ground-dwelling vertebrate faunas found in hummock grassland and mulga scrubland in central Australia. *Herpetofauna* **16:** 49-52.

HENLE, K., 1988. Population Ecology and Life History of a Lizard Community in Arid Australia. Ph.D Thesis: Australian National University.

MCKENZIE, N. L. AND ROBINSON, A. C., 1987. *A Biological Survey of the Nullabor Region South and Western Australia in 1984.* Government Printer, Adelaide.

MERRILEES, D., 1973. Fossiliferous deposit at Lake Tandou, New South Wales, Australia. *Mem. Nat. Mus. Vic.* **34:** 177-82.

MORTON, S. R., 1982. Dasyurid Marsupials of the Australian Arid Zone: An Ecological Review. Pp. 117-30 *in 'Carnivorous Marsupials'* ed. by M. Archer. Roy. Zool. Soc. New South Wales, Sydney.

PIANKA, E. R., 1986. *Ecology and Natural History of Deserty Lizards.* Princeton University Press, Princeton.

ROBERTSON, G., SHORT, J. AND WELLARD, G., 1987. The environment of the Australian sheep rangelands. Pp. 14-34 *in 'Kangaroos: their ecology and management in the sheep rangelands of Australia'* ed. by G. Caughley, N. Shepherd and J. Short. Cambridge University Press, Cambridge.

STRAHAN, R., 1983. *The Australian Museum Complete Book of Australian Mammals.* Angus & Robertson, Sydney.

TEDFORD, R. A., 1967. The fossil Macropodidae from Lake Menindee, New South Wales. *Univ. Calif. Publ. Geol. Sci.* **64:** 1-165.

TIDEMANN, C. R., 1988. A survey of the mammal fauna of the Willandra Lakes World Heritage region, New South Wales. *Aust. Zool.* **24:** 197-204.